

THE TANAIDAE (CRUSTACEA; TANAIDACEA) OF CALIFORNIA, WITH A KEY TO THE WORLD GENERA

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Abstract.—Identification keys to the world genera and the California species of the family Tanaidae are presented. Diagnostic characters are discussed for *Sinelobus stanfordi* (Richardson), *Pancolus californiensis* Richardson, *Zeuxo normani* (Richardson), and *Zeuxo paranormani* Sieg. Two new species, *Synaptotanaïs notabilis* and *Anatanais pseudonormani* are described. Three additional species, *Zeuxo coralensis* Sieg, *Zeuxo maledivensis* Sieg, and *Zeuxo seurati* (Nobili), known to occur within the eastern Pacific region, are included in the identification keys. The distribution of all species are discussed.

Investigations in recent years have indicated that the tanaidacean Crustacea are among the more numerically abundant invertebrates of certain marine habitats (e.g. Livingston, 1977; Odum and Heald, 1972; Gage and Coghill, 1977). However, difficulties in identifying specimens to species or even family have impeded research on their biology. The identification keys to the suborders and families of the Tanaidacea by Sieg and Winn (1978) were an outcome of an examination of tanaids from benthic macrofaunal samples from the southern California borderland. It was stated then that additional identification keys, new species descriptions, and discussions of the families occurring along the California coast would be subsequently presented. The following is an examination of the members of the family Tanaidae from California.

Tanaidae Dana, 1849

Little is reported on the members of the family Tanaidae from California. *Tanaïs normani* Richardson and *Pancolus californiensis* Richardson, were originally described from Monterey Bay in northern California. Localities in southern California were noted for "*Anatanais normani*" by Miller (1968) at Catalina Island, Anacapa Island, Santa Barbara Harbor, and Moss Beach. Dillon Beach was mentioned as another locality for *Pancolus californiensis* by Lang (1961).

Miller (1968), and Miller and Menzies (1954) reported a *Tanaïs* sp., which was shown to be a male of *Sinelobus stanfordi* (Richardson) by Sieg (1980),

who also showed that the type-material of *Tanais normani* Richardson actually consisted of 2 species of *Zeuxo*, one of which is now referred to *Zeuxo paranormani* Sieg (1979).

None of these previously known species was collected from the benthic sampling program (Bureau of Land Management 1976–1977) off southern California, which emphasized shallow subtidal regions (13 m) to deep shelf, slope, and basin soft-bottom regions (1886 m). Two new species within the family Tanaidae, *Synaptotanais notabilis* and *Anatanais pseudonormani*, were found and are described here.

Several shallow, near-shore studies recently completed or now in progress have indicated the frequent presence of tanaidaceans in great numbers, up to thousands per m² (Muscat, pers. comm.; Hammer and Zimmerman, 1979; Straughan 1977). The highest density with 140,000/m² has been reported for *Kalliapseudes crassus* by Barnard (1970).

There are currently 6 known species of Tanaidae from California: *Anatanais pseudonormani* n. sp.; *Pancolus californiensis* Richardson, *Sinelobus stanfordi* (Richardson), *Synaptotanais notabilis* n. sp., *Zeuxo normani* (Richardson), and *Zeuxo paranormani* Sieg (for further details see Sieg, 1980). Three additional species known from the eastern Pacific region, *Zeuxo maledivensis* Sieg, *Z. seurati* (Nobili), and *Z. coralensis* Sieg are included in the following key to the California species of Tanaidae, since there is some possibility they may be found there also.

The terminology used is based on that suggested by Racovitza (1923) for the Isopoda, with modifications proposed by Sieg (1973, 1977, 1980), which includes a discussion of setae and spines of the Tanaidacea.

There has been much variation in the nomenclature applied to body segments and appendages for the Tanaidacea as discussed by Hansen (1913), Lang (1953), Wolff (1956, 1962) and Gardiner (1975). Gardiner summarized Wolff's terminology and suggested alternative terms to those used by Lang (1968). Lang's system is adopted here for the orientation of the appendages where: dorsal, ventral, medial, lateral are equivalent to tergal, sternal, rostral, and caudal, referring to limbs directed ventrally and laterally from the body, in their natural position. The abbreviations used for the figures are: A.1 (Antenna 1), A.2 (Antenna 2), L (Labrum), Md_l (left mandible), Md_r (right mandible), La (labium), Mx.1 (maxilla 1) Mx.2 (maxilla 2), Epi (epignath), Mxp (maxilliped), che (cheliped), P.1–P.6 (pereopod 1–6), Pl. 1–5 (pleopod 1–5), Plt (pleotelson) and Uro (uropod).

Key to the World Genera of the Family Tanaidae
 (Modified from Sieg, 1980)
 (*Not yet recorded from California)

- 1. Uropods long and slender, articles more than twice as long as broad (Fig. 1, Uro: 1) 2

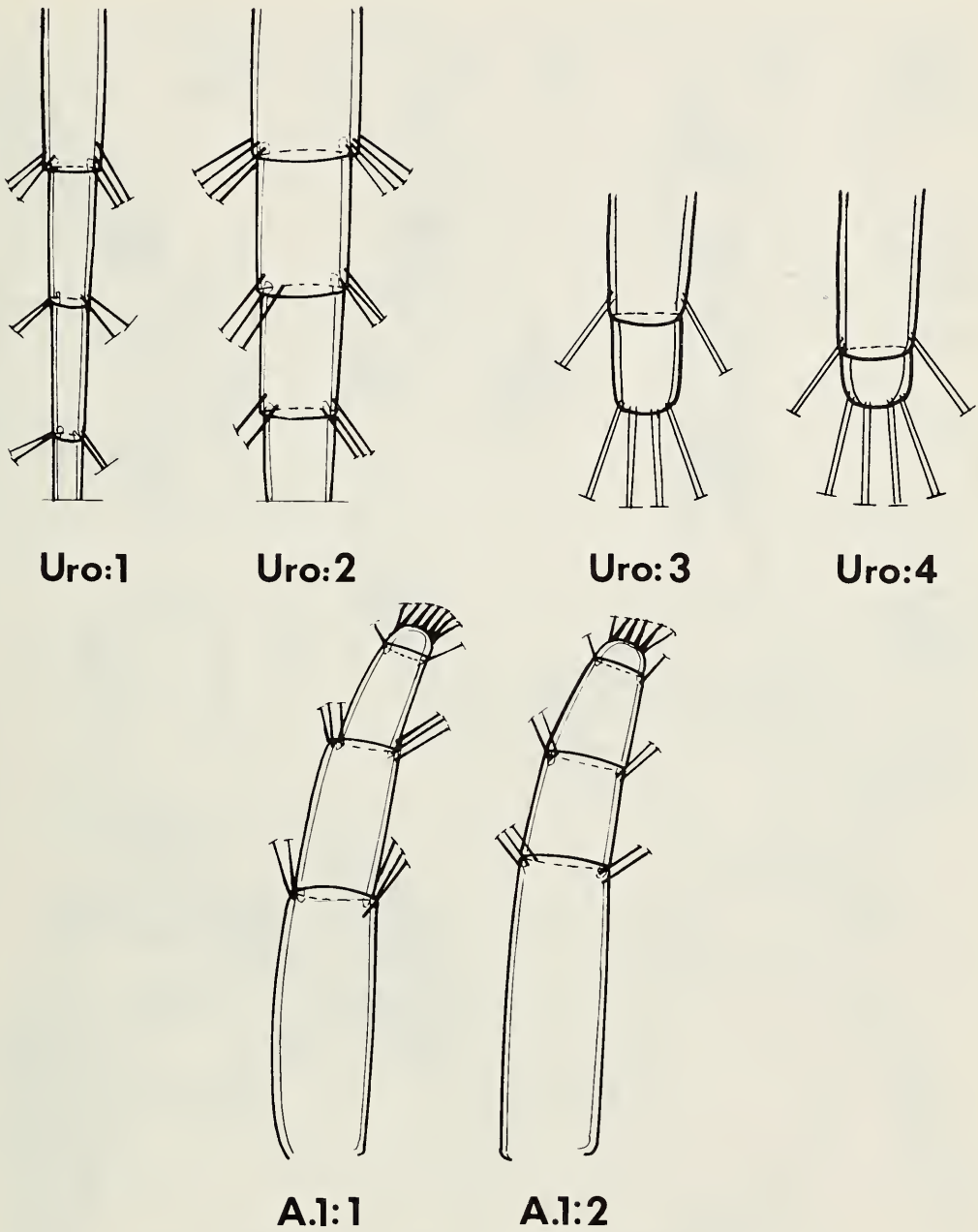


Fig. 1. Uropods and antenna 1 of different members of Tanaisidae. Uro: 1—uropod long and slender, articles more than twice as long as broad; Uro: 2—uropod short, articles twice as long as broad; Uro: 3—uropod with terminal article normal; Uro: 4—uropod with terminal article greatly reduced; A.1: 1—antenna 1 with first article twice length of second article; A.1: 2—antenna 1 with first article more than 2.5 times length of second article.

- Uropods short, articles twice (rarely 3 times) as long as broad (Fig. 1, Uro: 2) 5
- 2. Antenna 1 of 5 articles, first and second article with many distal setae; cephalothorax broader than long *Archaeotanais* Sieg*

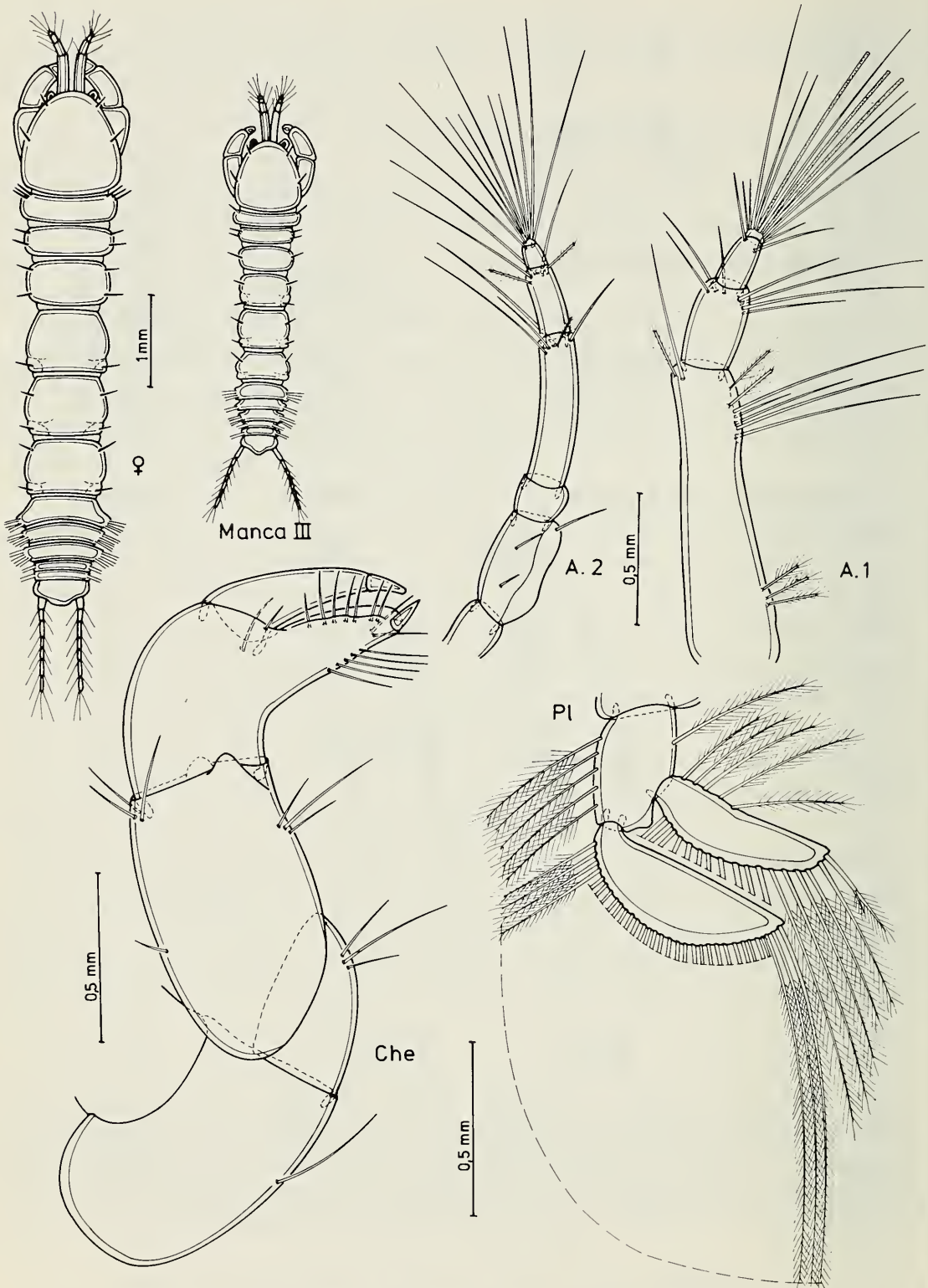


Fig. 2. *Synaptotanaïs notabilis*, female.

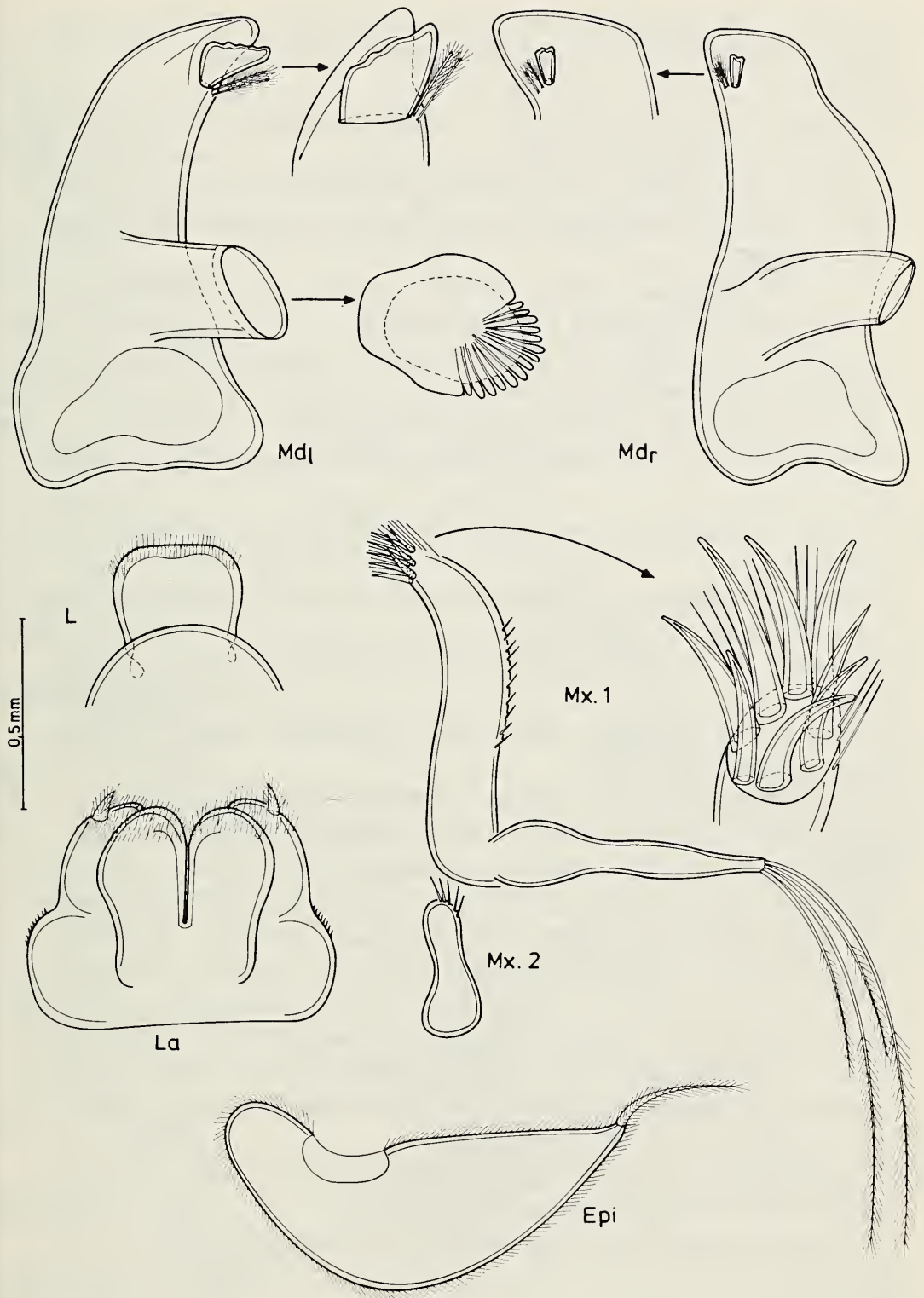


Fig. 3. *Synaptotanais notabilis*, female.

- Antenna 1 of 4 articles, first and second article with few distal setae; cephalothorax longer than broad (Uro about "6 to 11-jointed") 3
- 3. Endopod of uropods of at least 10 articles; antenna 2 of 8 articles; outer lobe of labium with spine *Langitanais* Sieg*
- Endopod of uropods of 5-6 articles; antenna 2 of 7 articles; outer lobe of labium without spine, with or without terminal article (Uro "6-7 jointed") 4
- 4. Outer lobe of labium without terminal article; tergite of fifth pleonite not distinctly separate from pleotelson *Protanais* Sieg*
- Outer lobe of labium with terminal article; tergite of fifth pleonite distinctly separate from pleotelson *Synaptotanais* Sieg
- 5. Terminal article of uropods greatly reduced (Fig. 1, Uro: 4) 6
- Terminal article of uropods normal, not reduced (Fig. 1, Uro: 3) 8
- 6. Pleopod 3 reduced; carpal spines of pereopods 2-4 strongly produced 7
- Pleopod 3 normal, not reduced; carpal spines of pereopods 2-4 normal, not strongly produced *Zeuxoides* Sieg*
- 7. Antenna 1 of 3 articles; pleon with 3 pleonites (tergites) visible dorsally *Pancolus* Richardson
- Antenna 1 of 4 articles; pleon with 5 pleonites (tergites) visible dorsally, plus pleotelson *Pancoloides* Sieg
- 8. Pleon with 4 pleonites (tergites) visible dorsally, plus pleotelson . 11
- Pleon with 5 pleonites (tergites) visible dorsally, plus pleotelson .. 9
- 9. Coxa of pereopod 1 without protuberance; pereonites 1-3 combined not longer than broad; terminal lobe of outer lobe of labium not well separated; chelae of male greatly enlarged, therefore, cephalothorax of males in cross-section nearly triangular *Hexapleomera* Dudich*
- Coxa of pereopod 1 with or without protuberance; pereonites 1-3 large, combined longer than broad; terminal lobe of outer lobe of labium well separated; chelae of male not greatly enlarged, therefore, cephalothorax of male normal 10
- 10. First article of antenna 1 greater than 2.5 times, often 3 times, length of second article (Fig. 1, A.1: 2) *Zeuxo* Templeton
- First article of antenna 1 twice length of second article (Fig. 1, A.1: 1) *Anatanais* Nordenstam
- 11. Uropods of 7 articles *Arctotanais* Sieg
- Uropods of 2-5 articles 12
- 12. Pleonites 1 and 2 with strong transverse rows of long plumose hairs 13

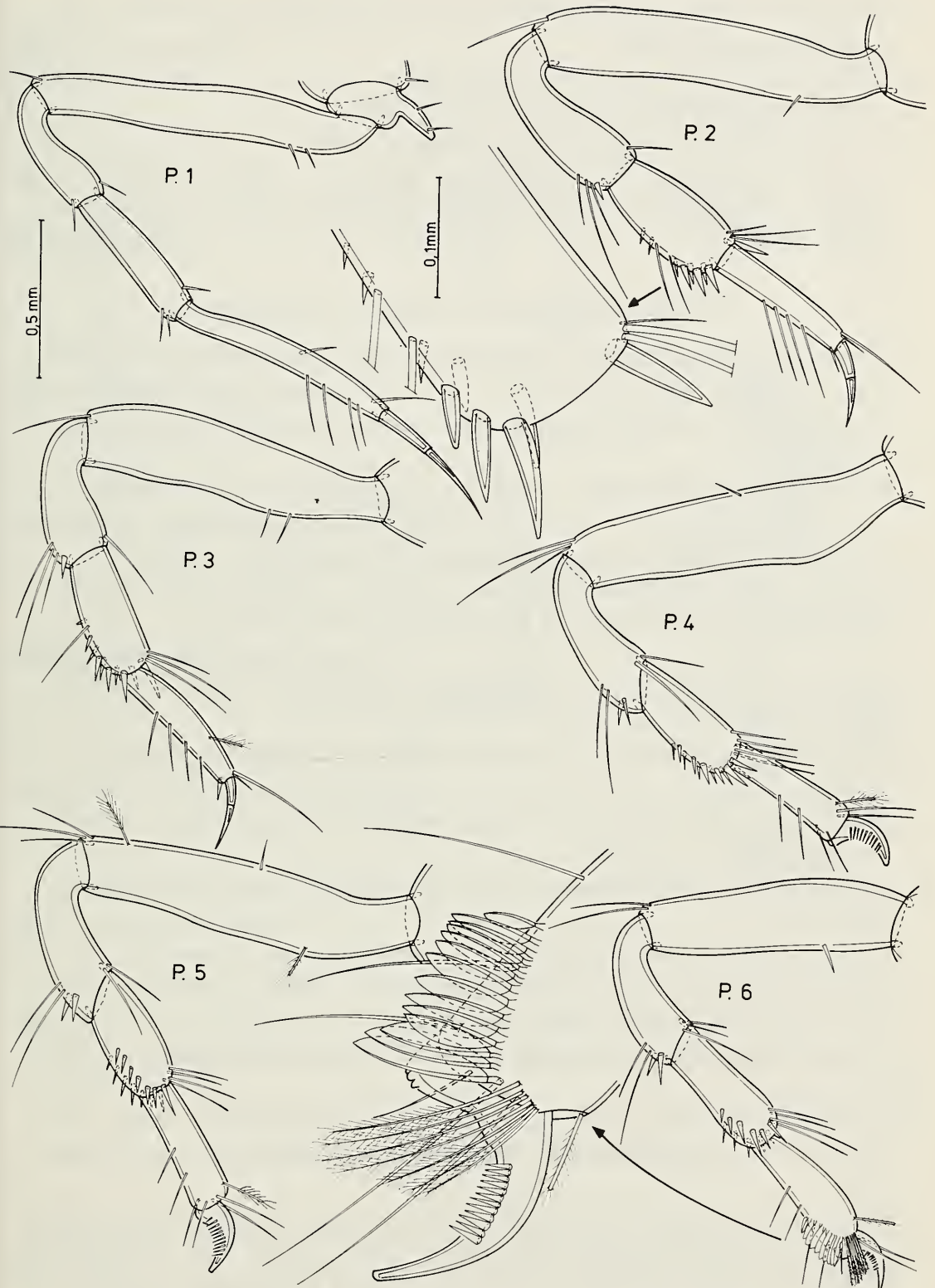


Fig. 4. *Synaptotanaeis notabilis*, female.

- Pleonites 1 and 2 without transverse rows of setae, but with a few lateral plumose hairs *Monoditanais* Sieg*
- 13. Outer lobe of labium with terminal lobe *Tanais* Latreille*
- Outer lobe of labium without terminal lobe 14
- 14. Fourth article of antenna 2 with circle of setae
..... *Parasinelobus* Sieg*
- Fourth article of antenna 2 without circle of setae, but with few distal setae *Sinelobus* Sieg

Key to the Species of California Tanaidae

1. Uropods long and slender, articles more than twice as long as broad (Fig. 1, Uro: 1; Figs. 2-5; 12) *Synaptotanais notabilis* n. sp.
- Uropods short, articles twice as long as broad (rarely 3 times) (Fig. 1, Uro: 2) 2
2. Pleon of 3 pleonites plus pleotelson; pleopod 3 reduced (Fig. 7) *Pancolus californiensis* Richardson
- Pleon of 4-5 pleonites plus pleotelson; pleopod 3 not reduced 3
3. Pleon of 4 pleonites plus pleotelson; pleonites 1 and 2 each with well developed transverse row of long plumose setae (Fig. 6)
..... *Sinelobus stanfordi* (Richardson)
- Pleon of 5 pleonites plus pleotelson; pleonites 1 and 2 with few lateral plumose setae 4
4. First article of antenna 1 2.0 times length of second article (Fig. 1, A.1: 1) *Anatanais pseudonormani* n. sp.
- First article of antenna 1 2.5 times length of second article, nearly 3.0 times (Fig. 1, A.1: 2) 5
5. Uropods of 4 articles (adults); coxa of pereopod 1 produced slightly (Fig. 15) *Zeuxo coralensis* Sieg*
- Uropods of 5-6 articles (adults) 6
6. Lacina mobilis of right mandible reduced to small projection (Fig. 17); coxa of pereopod 1 produced slightly *Zeuxo seurati* (Nobili)*
- Lacina mobilis of right mandible only slightly reduced (Figs. 13-16) 7
7. Coxa of pereopod 1 with strong, triangular protuberance (Figs. 13, 14); inner border of endopod of pleopods with more than 1 proximal setae 8
- Coxa of pereopod 1 with small, triangular protuberance (Fig. 16); endopod of pleopods with 1 proximal seta.. *Zeuxo maledivensis* Sieg*
8. Uropods of 6 articles (adults, Fig. 13); coxa of pereopod 1 with large protuberance (Fig. 13); carpus of pereopod 2 with 4 caudal and 2 rostral spines (Fig. 13) *Zeuxo normani* (Richardson)
- Uropods of 5 articles (adults, Fig. 14); coxa of pereopod 1 with less

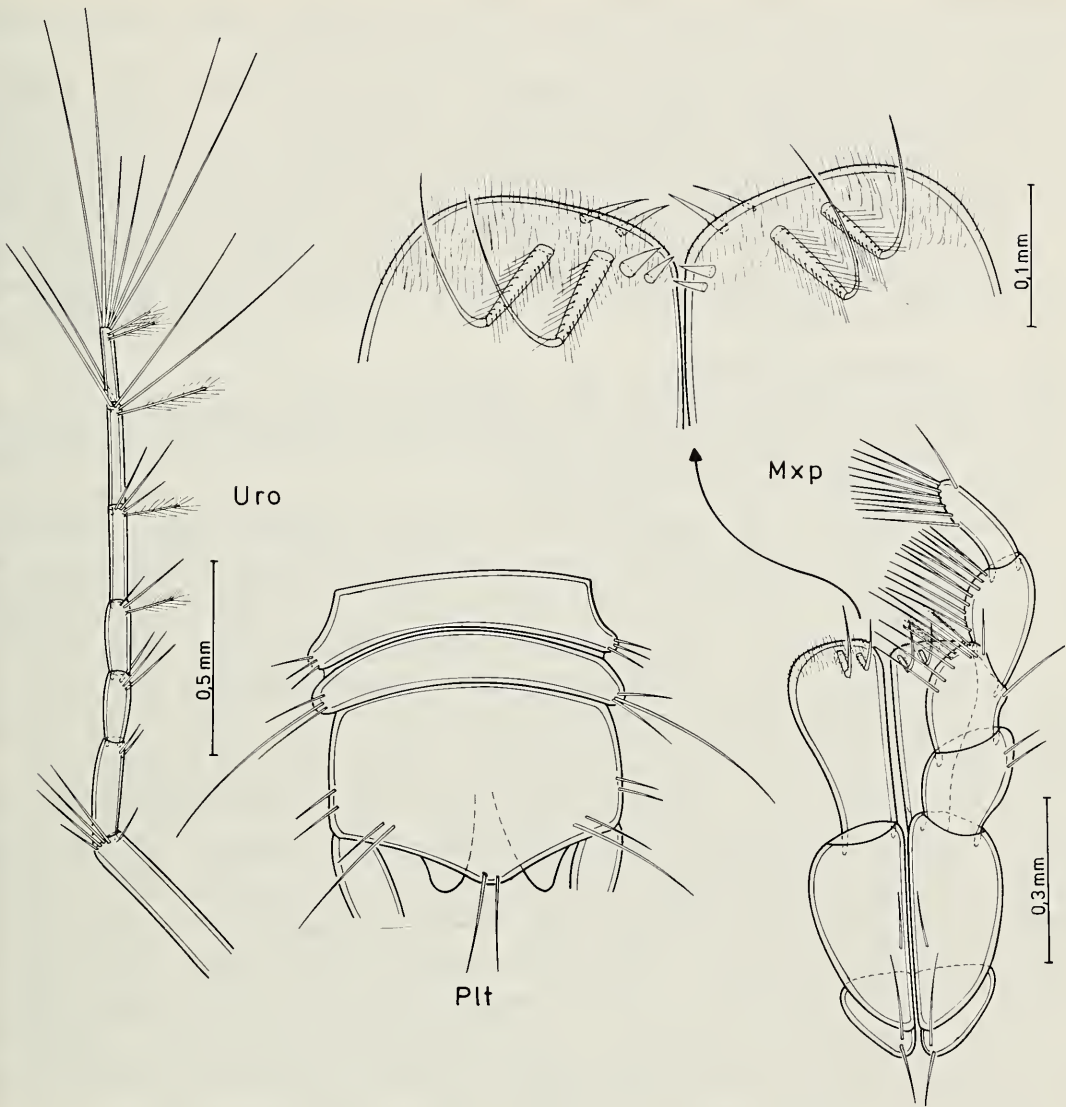


Fig. 5. *Synaptotanaïs notabilis*, female.

pronounced protuberance; carpus of pereopod 2 with 3 caudal and 2 rostral spines *Zeuxo paranormani* Sieg

Synaptotanaïs notabilis, new species

Figs. 2-5, 12

Description (females, neuters).—Body length of fully developed specimens about 7 mm.; manca stages and neuters smaller; slightly more than 4 times as long as broad.

Cephalothorax smoothly rounded; narrowing from posterior to anterior; 1.2 times longer than broad, with small rostral eye-lobes separated from

cephalothorax by concave sutures; 1 small seta nearby, and additional lateral seta.

Pereon with first 3 pereonites laterally rounded in dorsal view. Last 3 pereonites with swollen region posteriorly. Pereonite 1 3.5 times broader than long; anterior border smoothly concave, with few setae anterolaterally near exhalent opening. Pereonite 2–3 times broader than long, lateral margin with 1 seta rostrally and 1 at the middle. Pereonite 3 twice as broad as long, bearing setae similar to pereonite 2. Pereonite 4 1.2 times broader than long, with 1 seta in each lateral corner. Pereonite 6 1.5 times broader than long, similar to pereonites 4 and 5.

Pleon with 5 distinct segments plus pleotelson visible in dorsal view. Last 2 segments smaller. Fifth pleonite (sternite) fused ventrally with pleotelson. Pleonites 1–3 with lateral plumose setae.

Antenna 1 (Fig. 2) of 4 articles. First article relatively large, 5.0 times longer than broad; inner border with 3 plumose hairs proximally, 5 setae and 2 plumose hairs distally; outer border with 1 seta and 1 plumose hair distally. Second article twice as long as broad; inner border with 4 distal setae; outer border with 3 distal setae. Third article small, but also twice as long as broad; inner border and outer border each with 1 distal seta. Fourth article minute, conical, with 3 short setae, 7 long setae and 3 esthetascs.

Antenna 2 (Fig. 2) of 7 articles. First article fused with cephalothorax, as long as broad, without setae. Second article twice as long as broad; outer border with flange, with distal seta; inner border with 2 setae. Third article small, as long as broad, without setae. Fourth article 4.0 times longer than broad; inner border with 3 distal setae; outer border with 1 seta and 2 plumose hair. Fifth article 2.5 times longer than broad; inner border with 2 setae and 1 plumose hair distally; outer border with 1 seta and 1 plumose hair. Sixth article as long as broad; inner and outer border with 1 distal seta. Seventh article minute, peak-like, with 4 short and 4 long setae.

Labrum (Fig. 3) hood-like, completely covered with fine hairs.

Mandible (Fig. 3) strongly produced. 0.33 of border of the terminal face of the pars molaris toothed. Lacinia mobilis of left mandible well developed, border distally crenulate, with 2 plumose membranous spines near articulation. Lacinia mobilis of right mandible distinctly smaller than left.

Labium (Fig. 3) with an inner and outer lobe, divided deeply in middle, distally covered with fine hairs. Outer lobe with terminal article and proximally with small lateral spines.

Maxilla 1 (Fig. 3) with uniaarticulate palp bearing 4 fine, plumose terminal setae; endite with 8 spines surrounded by distal setae.

Maxilla 2 (Fig. 3) long, oval, with small terminal setae.

Maxilliped (Fig. 5) developed normally; coxa perpendicular to basis, with 2 mid-ventral setae; not fused medially. Basis not fused medially; also with 1 mid-dorsal seta. Palp of exopod of 4 articles. First article 1.5 times longer

than broad, with 2 setae on outer border. Second article triangular; outer border concave, bearing 1 long seta; inner border bearing 3 plumose and 6 naked setae. Third article twice as long as broad; inner border slightly convex, with 2 rows of 8 and 4 setae. Fourth article 3.0 times longer than broad; outer border with 1 distal seta and inner border with 2 rows of 6 setae each. Endopod (inner lobe) not fused medially; with 2 oblique setae distally and 2 membranous spines medially (“coupling-hooks” *sensu* Lang, 1968).

Epignath (Fig. 3) kidney-shaped, with small appendix, completely covered with fine hairs.

Cheliped (Fig. 2) well developed, but slender. Basis twice as long as broad, with medial seta mid-ventrally. Merus triangular; ventrally with 3 medial setae. Carpus small, about twice as long as broad; ventrally with 3 medial setae on the distal third; mid-dorsally with 1 seta and distally with 3 medial setae. Propodus and fixed finger slightly shorter than carpus, with 1 medial and 1 lateral seta near articulation of dactylus. Fixed finger with spine at its tip and 2 lateral setae; dorsal border with 7, and ventral border with 5 setae. Dactylus with spine, curved slightly.

Pereopod 1 (Fig. 4) long and slender. Coxa having non-moveable articulation with sternite, with long prominent protuberance bearing 2 setae. Basis more than 6.0 times longer than broad; proximal third with 2 small sternal setae; distally with 1 tergal seta. Ischium absent. Merus 3.5 times longer than broad; sternally and tergally each with caudal seta distally. Carpus about 5.0 times longer than broad; tergally with 2 and sternally with 1 lateral setae distally. Propodus slender, more than 7.0 times longer than broad; middle with rostral seta sternally. Dactylus and spine combined slightly longer than 0.5 length of propodus.

Pereopod 2 (Fig. 4) with coxa fused with sternite, without protuberance. Basis 4.5 times as long as broad; sternally with 1 proximal seta; tergally with 1 distal seta. Ischium absent. Merus 3.5 times longer than broad; tergally with 3 caudal setae distally and 1 caudal spine; sternally with caudal seta. Carpus twice as long as broad; with 3 caudal setae distally and nearby medial spine sternally; distal tergal border with 3 caudal spines, 2 caudal setae and 5 rostral spines, 2 of which are very small. Propodus 4.5 times as long as broad; tergal row of 4 caudal setae and rostral seta distally; sternally with 1 caudal and 1 rostral seta distally. Dactylus and spine combined 0.5 as long as propodus.

Pereopod 3 (Fig. 4) proportions and armament mainly similar to pereopod 2. Carpus tergally with 4 caudal spines and caudal seta distally. Propodus tergally with 1 rostral spine.

Pereopod 4 (Fig. 4) coxa fused with sternite, with no distinguishing features. Basis 4.0 times longer than broad; middle and distal portions each with 3 tergal setae. Ischium absent. Merus 2.5 times longer than broad; distally with caudal and rostral seta sternally, and caudal and rostral spine

tergally surrounding 2 setae. Carpus twice as long as broad, with ventral indenture for the propodus and 3 caudal and 2 rostral setae; distal row of dorsal spines consists of 6 caudal and rostral spines each. Propodus 3.5 times longer than broad; sternally with plumose hair and 1 rostral and 1 caudal seta; tergally with 2 setae near midlength and distally with 1 rostral and 1 caudal seta. Dactylus and spine coalesced to claw bearing row of membranous spines rostrally and caudally.

Pereopod 5 (Fig. 4) proportions and armament as in pereopod 4. Carpus sternally with 2 rostral and 2 caudal distal setae; tergally with row of 7 spines rostrally and caudally.

Pereopod 6 (Fig. 4) proportions and armament similar to 4 and 5. Carpus with 6 caudal and rostral spines distally. Propodus bears distal row of scapelliform setae tergally; sternally with 7 plumose setae and plumose hair between long caudal and rostral setae.

Pleopods (Fig. 2) similar, not reduced. Outer border of basis with 5 setae, inner border with 1 seta. Exopod of 1 article, without setae on inner border and with many setae on outer border. Endopod of 1 article, with some setae on proximal inner border; outer border bears many setae, distal seta biciliated (specialized).

Pleotelson (Fig. 5) caudal point prominent, with 2 long setae; 1.5 times broader than long, with 2 long and 2 shorter caudal setae near articulation with uropods. Last pleonite partly fused with pleotelson; tergally well marked, sternally totally fused.

Uropods (Fig. 5) long and slender; consisting of basis and 6-articled endopod (Uro: "7-jointed"). Basis 5.0 times as long as broad, distally with 3 long and 2 short setae. Endopod with first article less than 4.0 times as long as broad, distally with 2 short setae. Second and third article less than 3.0 times as long as broad; second with 3 distal, third with 2 distal setae and a plumose hair. Fourth and fifth article 5.0 time as long as broad; fourth with 3 short setae and 1 plumose hair distally. Sixth article 4.0 times as long as broad, with 4 long and 2 short setae, and 2 plumose hairs distally.

Etymology.—The specific name is taken from the Latin word for "notable."

Material.—*Velero IV* sta. 23092/BLM 182 (33°39'0"N, 120°6'1"W), off Santa Rosa Island, California, 133 m: 5 ♀♀:1 ex. Senckenberg Museum Frankfurt SMF 8674, 2 sp. coll. Sieg, 2 ex. USNM 170654. *Velero IV* sta. 23093/BLM 183 (33°39'0"N, 119°58'0"W), off Santa Rosa Island, 133 m: 1 ♀, University of Southern California, Allan Hancock Foundation. *Velero IV* sta. 23187/BLM 79 (33°45'9"N, 120°03'0"W), off Santa Rosa Island, 133 m: 2 ♀♀, University of Southern California, Allan Hancock Foundation.

All specimens are syntypes, with *Velero IV* sta. 23092 designated as type-locality.

Discussion.—This species is readily distinguishable by its slender uropods

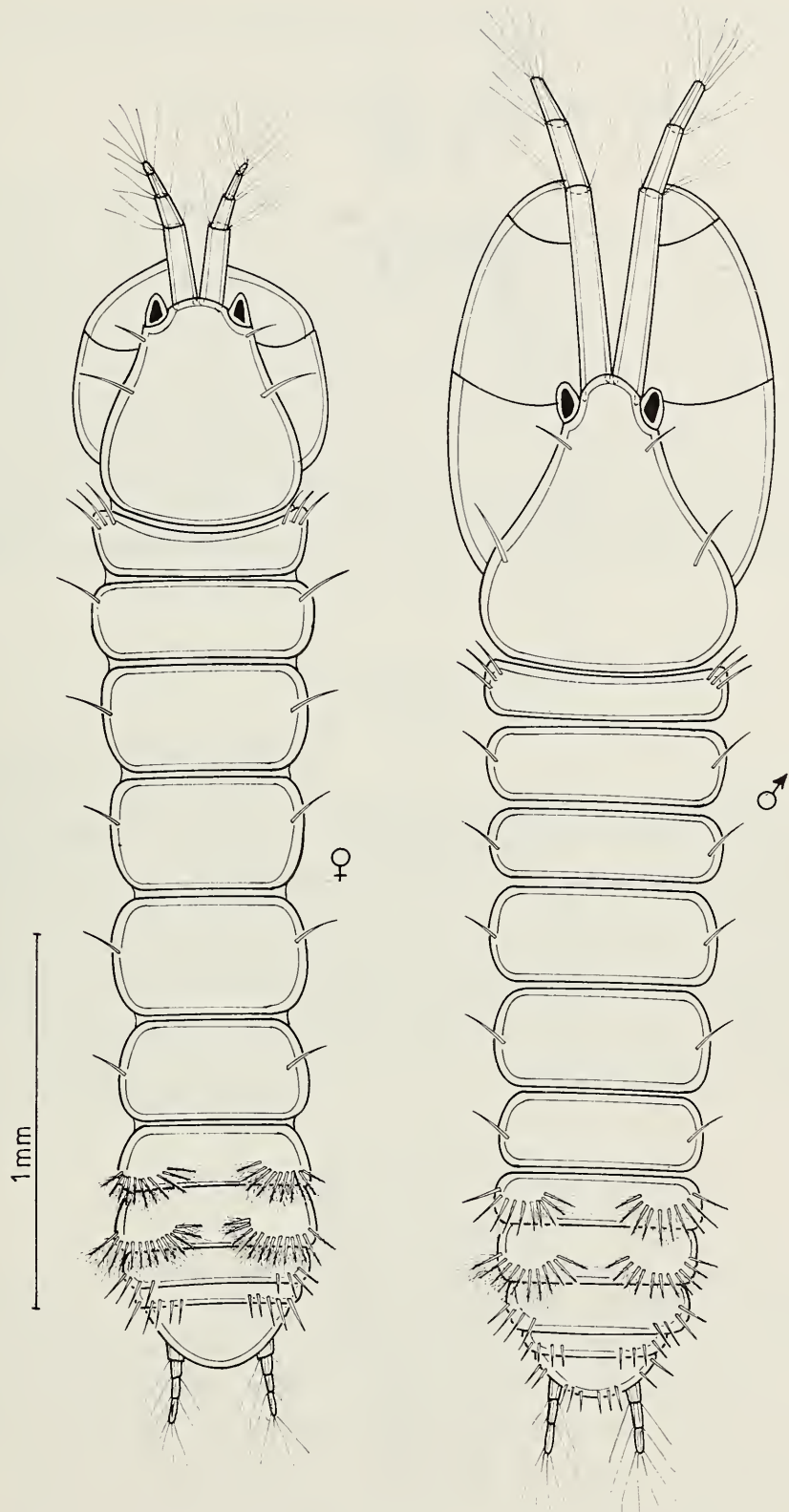


Fig. 6. *Sinelobus stanfordi*, female and male.

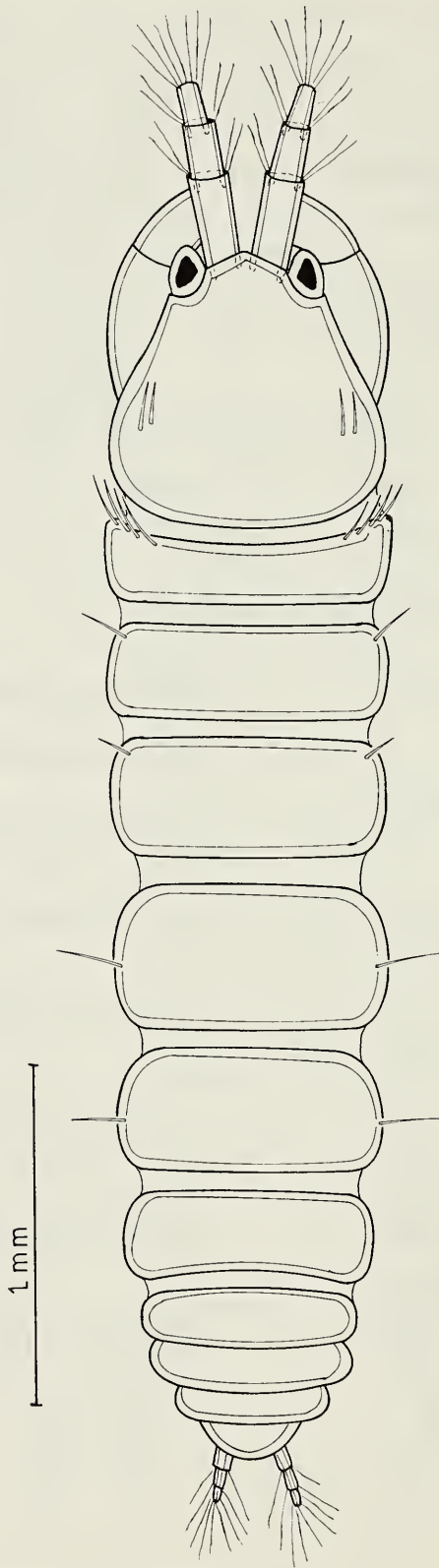


Fig. 7. *Pancolus californiensis*, female.

and relatively long first articles of antenna 1. Its present distribution is limited to the southern California borderland.

Sinelobus stanfordi (Richardson, 1901)

Fig. 6

Synonymy, see Sieg (1980).

Discussion.—The “*Tanais*” sp. mentioned by Miller (1968), and Miller and Menzies (1954) belongs to *Sinelobus stanfordi* as noted by Sieg (1980). The species may be recognized by the 5-segmented pleon (4 pleonites and the pleotelson), first and second pleonite with 2 curved rows of long, plumose vertical setae. The third pleonite also bears some plumose setae. *Sinelobus* is distinguished from the “true” *Tanais* by the loss of the terminal lobe in the labium and by the cephalothorax of males narrowing markedly from posterior to anterior (Fig. 6). The species is cosmopolitan and occurs in shallow intertidal and estuarine areas, including some records from fresh water.

Pancolus californiensis Richardson, 1905

Fig. 7

Synonymy, see Sieg (1980).

Discussion.—This species is easily recognized by its 4-segmented pleon (3 pleonites and the pleotelson). There appears to be no other species which share this character. Good descriptions and discussions of affinities have been given by Lang (1960) and Sieg (1980). The known distribution is from Monterey Bay in northern California (Richardson, 1905) to central California (although few records are available), and into southern California. In recent studies within southern California, *Pancolus californiensis* has been found mainly in intertidal and shallow subtidal areas associated with algae, or coarse-grained, sandy beaches.

Anatanais pseudonormani, new species

Figs. 8–11, 12

Description. (females, neuters).—Length of body 4–5 mm. Lateral margin of cephalothorax not rounded, slightly narrowed from posterior to anterior, 1.2 times longer than broad, with small rostral indentations separating eye-lobes, with 2 small setae nearby and an additional lateral seta.

Pereonites similarly rounded laterally in dorsal view, with seta in antero-lateral corners and occasionally in middle. Pereonite 1 4.5 times as broad as long; anterior border smoothly concave, with some setae near exhalent opening. Pereonite 2 3.0 times, and pereonite 3 2.3 times broader than long. Following 3 segments broaden posteriorly. Pereonites 4 and 5 1.8 times broader than long. Pereonite 6 twice as broad as long.

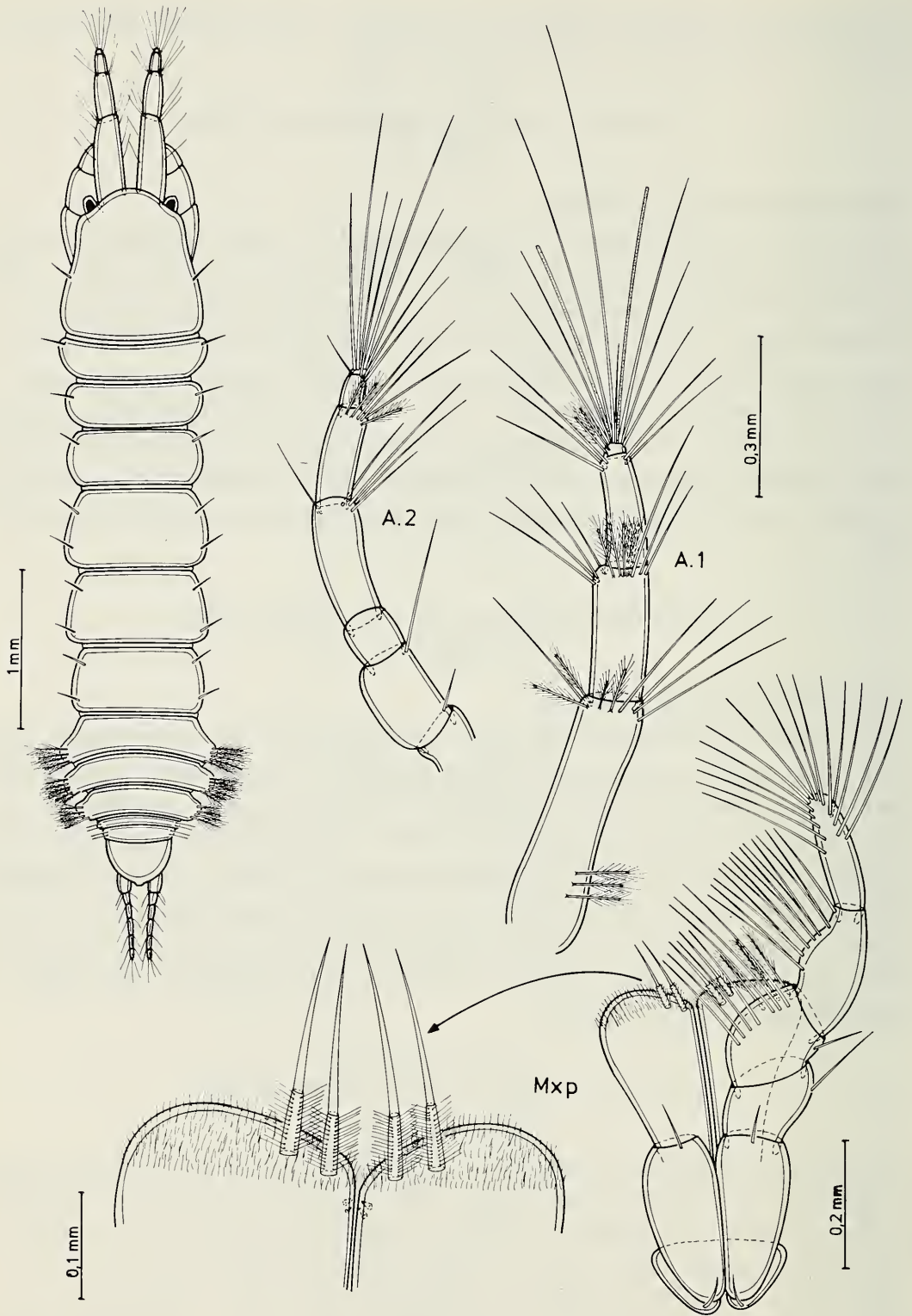


Fig. 8. *Anatanais pseudonormani*, female.

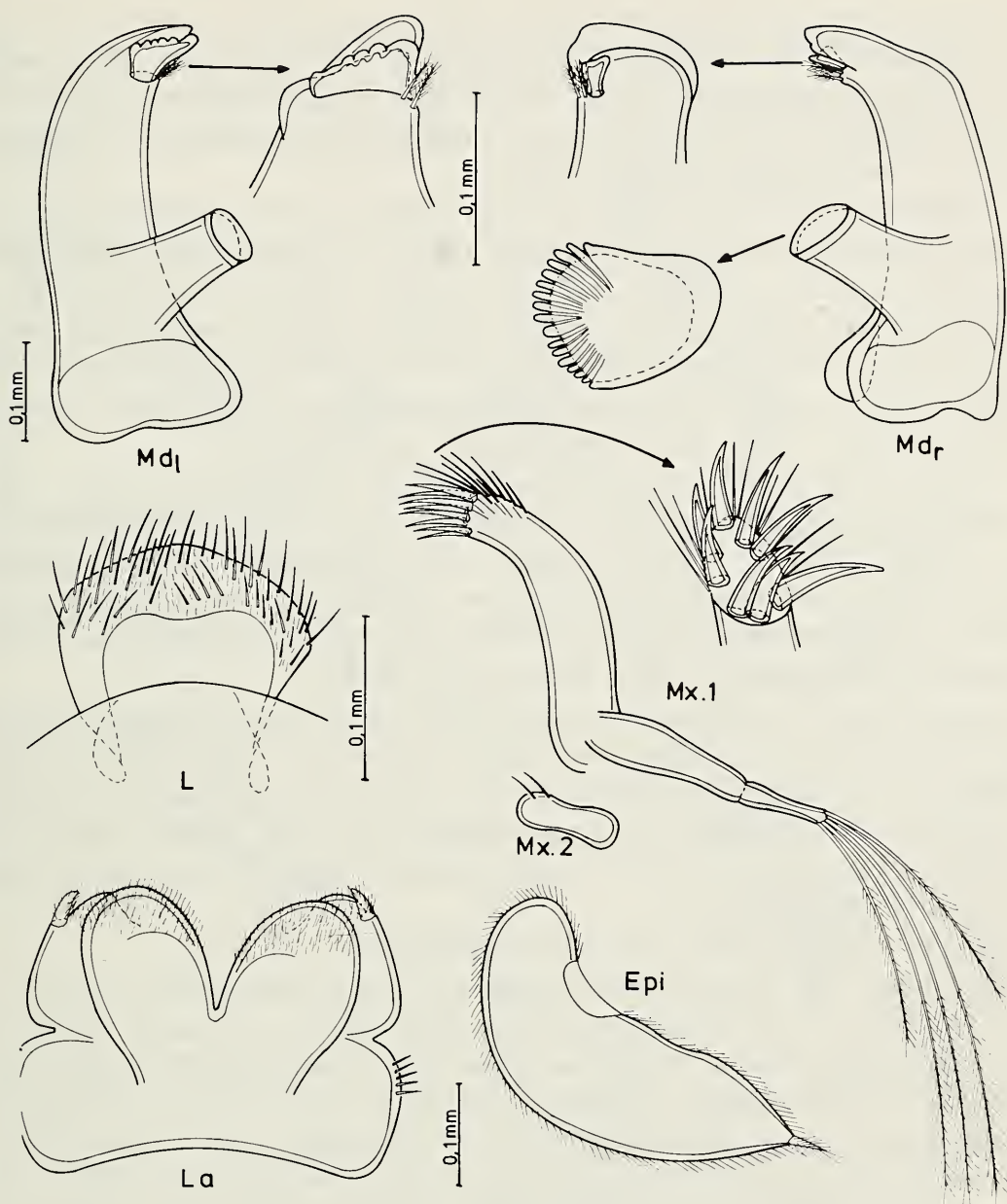


Fig. 9. *Anatanais pseudonormani*, female.

Pleon (Fig. 8) with 5 segments visible in dorsal view, plus pleotelson. First 3 pleonites relatively large, posterolaterally produced, bearing some plumose setae. Pereonites 1–3 (in dorsal view) 5.0 times broader than long; 4 and 5 small and compressed anterior to posteriorly; nearly 7.0 times broader than long, with 2 lateral setae.

Antenna 1 (Fig. 8) of 4 articles. First article 4.0 times longer than broad; proximal 0.33 of outer border with 2 plumose setae; outer border with 4 setae and inner border with 4 plumose setae and 1 normal seta distally.

Second article nearly 3.0 times longer than broad; outer border with 3 setae and 5 plumose setae distally; inner border with 4 distal setae. Third article also 3.0 times longer than broad; outer border with 2 and inner border with 3 setae distally. Fourth article minute, conical with 2 esthetascs, 2 plumose, 2 short, 2 very long and 4 other setae.

Antenna 2 (Fig. 8) of 7 articles. First article fused with cephalothorax; as long as broad, without setae. Second article 1.5 times longer than broad; inner border with 1 seta proximally and distally. Third article also small, as long as broad, without setae. Fourth article 2.7 times longer than broad; inner border with 4 setae; outer border with 3 normal and 3 plumose setae distally. Sixth article somewhat longer than broad, with 3 setae. Seventh article minute, conical, with 1 short and 5 long setae.

Labrum (Fig. 9) hood-shaped, completely covered with fine hairs.

Mandibles (Fig. 9) developed normally; 0.33 of border of terminal face of pars molaris toothed. Lacinia mobilis of left mandible well developed and distally with round teeth, with 2 plumose membranous spines near its articulation. Lacinia mobilis of right mandible reduced, but recognizable, bearing 2 plumose membranous spines near its articulation.

Labium (Fig. 9) with inner and outer lobes, both deeply incised in middle. Distal part of inner lobe with fine hairs. Outer lobe with terminal article, distally covered with fine hairs and row of small lateral spines proximally.

Maxilla 1 (Fig. 9) with endite and uniarticulate palp. Endite with 8 stout terminal spines surrounded by circle of setae. Palp as long as endite, with 5 very fine plumose setae.

Maxilla 2 (Fig. 9) long, oval with 2 small setae.

Maxilliped (Fig. 8) developed normally. Coxa perpendicular to basis, not fused medially, with 1 mid-ventral seta. Basis slender and small when compared with palp; twice as long as broad, not fused medially, with only 1 small seta near articulation of palp. Palp of 4 articles; first article with outer border convex, 1.5 times longer than broad, with 1 seta. Second article triangular; outer border concave, bearing 1 seta; inner border with 3 strong plumose setae, and 7 normal setae. Third article 2.0 times longer than broad, inner border slightly convex with 2 rows of 7 setae each. Fourth article nearly 4.0 times as long as broad; outer border with 1 distal seta; inner border with 2 rows of 7 setae. Endopod (inner lobe) not fused, distally covered with fine hairs and with 2 biciliated (specialized) setae on each side, as well as 3 small membranous projections ("coupling hooks," *sensu* Lang, 1968).

Epignath (Fig. 9) kidney-shaped, with small appendix, completely covered with fine hairs.

Cheliped (Fig. 11) slender; coxa behind proximal conjunction of basis, latter article more than twice as long as broad, distally with a rostral seta sternally. Merus triangular; distally with 2 rostral setae sternally. Carpus

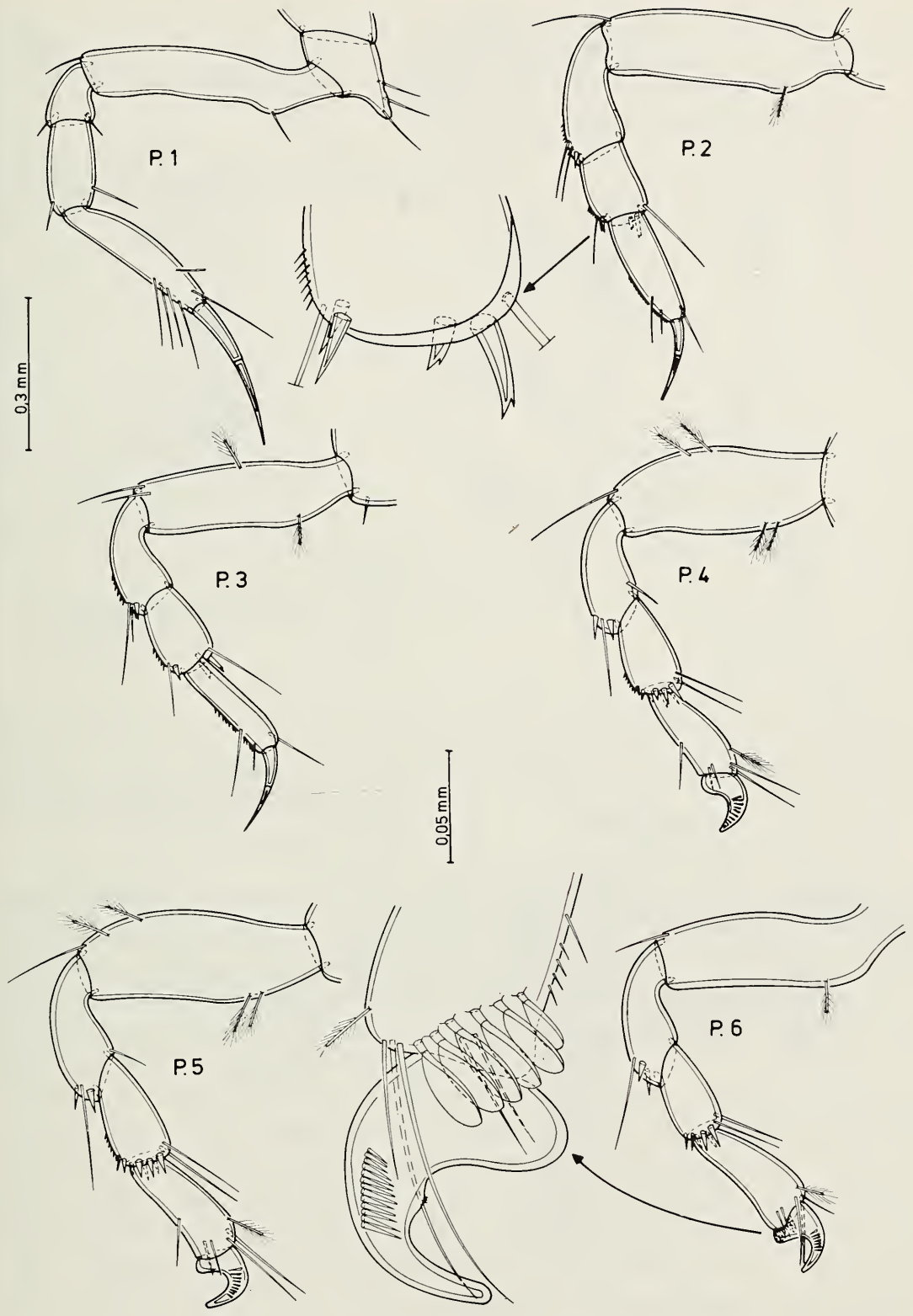


Fig. 10. *Anatanais pseudonormani*, female.

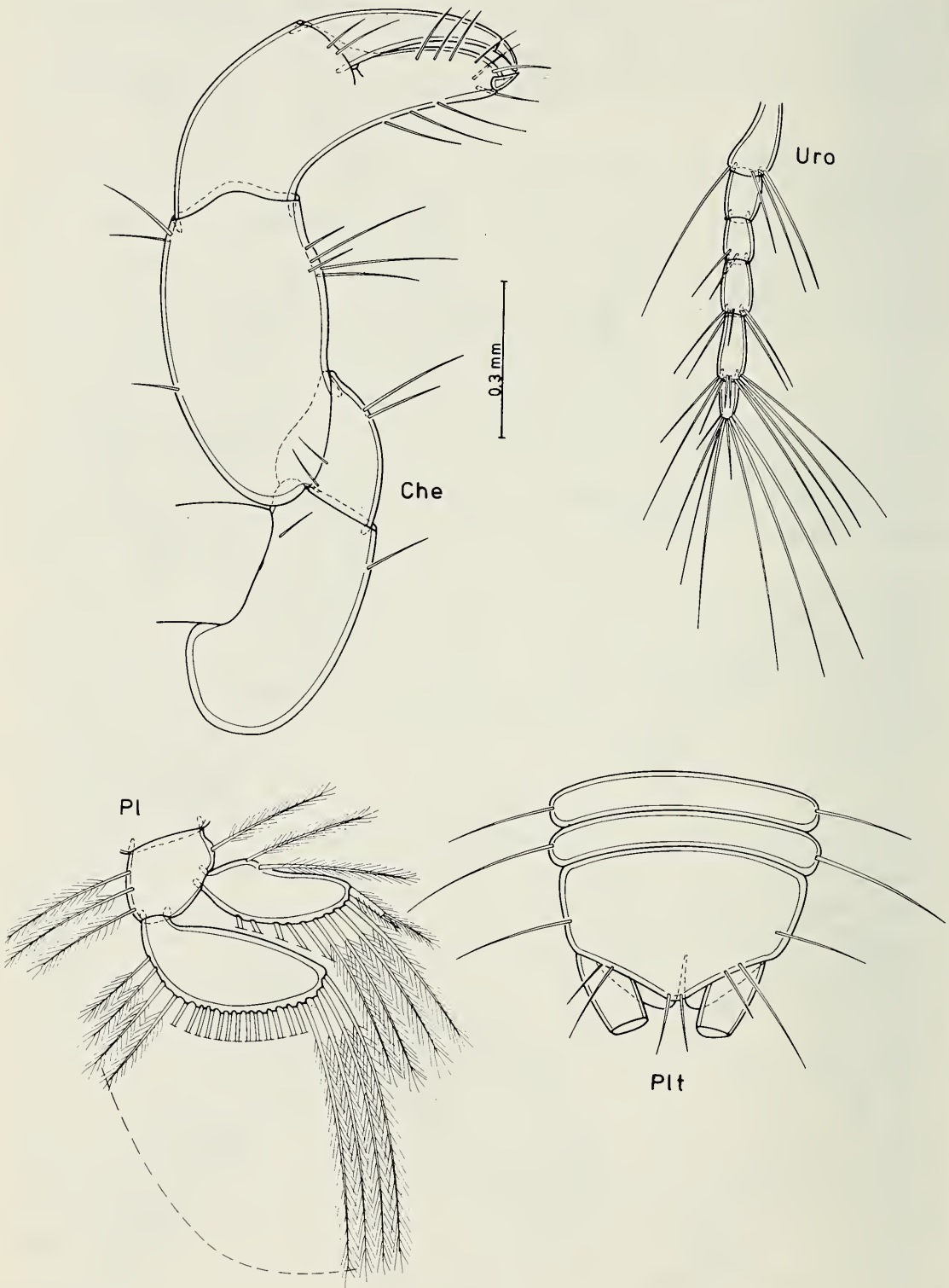


Fig. 11. *Anatanais pseudonormani*, female.

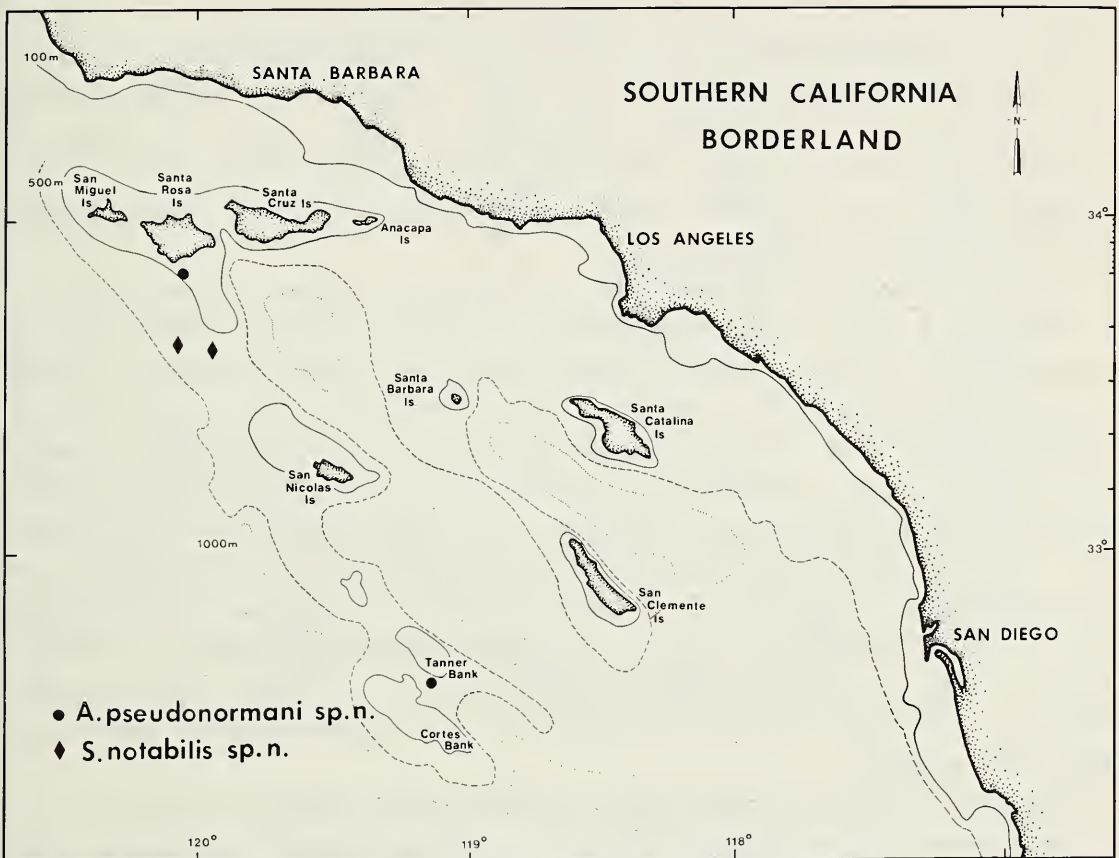


Fig. 12. Known distribution of *Synaptotanaïs notabilis* and *Anatanais pseudonormani* in the southern California borderland.

twice as long as broad, with 1 seta mid-tergally and 2 distal setae; sternally distal third bears group of 5 setae, inserting variously caudally or sternally. Propodus and fixed finger slender, as long as carpus, with 2 rostral setae near articulation of dactylus distally. Fixed finger with spine at tip and 2 caudal setae; dorsal border with 5 rostral and sternal border with 4 rostral setae. Dactylus with spine, slightly curved.

Pereopod 1 (Fig. 10) coxa fused with sternite, with prominent protuberance bearing 3 setae. Basis 5.5 times longer than broad, proximal third with 1 seta sternally, with another tergal seta distally. Ischium absent. Merus 1.5 times longer than broad; distally with 1 rostral seta tergally and sternally. Carpus twice as long as broad; distally with 1 caudal seta tergally and sternally. Propodus 4.7 times longer than broad, distal third with 4 tergal-caudal setae, some plumose hairs, and 1 caudal seta distal-sternally. Dactylus and spine combined as long as propodus.

Pereopod 2 (Fig. 10) with coxa fused to sternite, without specialized features. Basis 3.5 times longer than broad, proximal third with plumose hair

distally and dorsal seta distally. Ischium absent. Merus twice as long as broad, with tergal-caudal spine, 1 caudal and 1 rostral seta distally. Carpus 1.5 times longer than broad; sternally with 1 caudal seta distally; tergally with 1 spine and 1 seta caudally and 3 rostral spines, first twice length of second. Propodus 3.5 times longer than broad, distal third with 2 setae tergally and 1 seta sternally. Dactylus and spine combined slightly longer than 0.66 length of the propodus.

Pereopod 3 (Fig. 10) proportions and armament similar to pereopod 2.

Pereopod 4 (Fig. 10) strongly produced. Coxa fused to sternite, with no characteristic features. Basis 2.5 times longer than broad; proximal half with 2 plumose hairs sternally; tergally with 2 feathered hairs and 1 seta. Ischium absent. Merus twice as long as broad, slightly curved sternally, with 1 caudal seta; distally with 1 caudal and 1 rostral spine surrounding 1 seta tergally. Carpus twice as long as broad; sternally with distal indentation for propodus and 1 caudal and rostral seta distally. Caudal and rostral distal rows of spines consist of 4 spines each. Propodus 2.7 times as long as broad; tergally with 1 seta mid-tergally as well as a small caudal and rostral seta distally; sternally with a plumose hair, 1 long caudal and 1 rostral seta distally. Dactylus and spine fused to claw bearing row of membranous spines rostrally and caudally.

Pereopod 5 (Fig. 10) proportions and armament similar to pereopod 4.

Pereopod 6 (Fig. 10) proportions and armament similar to pereopod 4 and 5, but with a distal row of only 4 caudal spines dorsally. Propodus with additional short row of scalpelliform setae distally: sternally with small seta between long caudal and rostral setae.

Pleopods (Fig. 11) similar. Outer border of basis with 3 setae, inner border with 1 seta. Exopod of 1 article; outer border bearing many setae. Endopod of 1 article; inner border with 2 plumose proximal setae, outer border with many plumose setae, most distal one oblique (specialized).

Pleotelson (Fig. 11) 1.5 times broader than long, caudal point prominent, with 2 long setae. Caudal border with 2 additional setae on each side of caudal point, 1 seta laterally. Last 2 pleonites fused with pleotelson; tergites small but well marked; sternites partly fused with pleotelson.

Uropods (Fig. 11) with basis (Uro: "6-jointed"), endopod of 5 articles. Basis 2.5 times longer than broad; outer border with 3 distal and inner border with 1 distal seta. First 3 articles 1.4 times longer than broad. First article without distal setae. Second article with 2 setae along inner border. Third article with 2 setae along outer border and 3 setae along inner border. Fourth article 2.5 times longer than broad, with 4 distal setae along outer border and 5 distal setae along inner border. Fifth article twice as long as broad, with 6 long and 2 short setae.

Etymology.—The name was chosen because of the close resemblance to *Zeuxo normani* (Richardson).

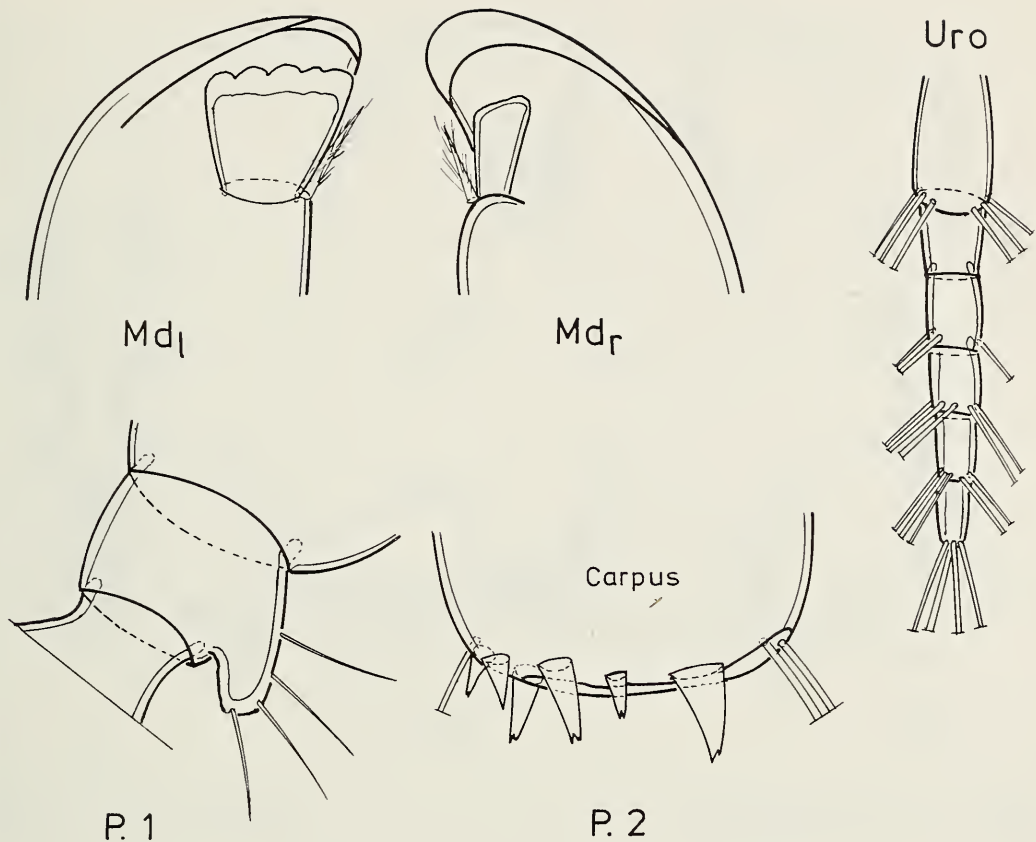


Fig. 13. *Zeuxo normani*.

Material.—*Velero IV* sta. 23045 ($33^{\circ}53'02''\text{N}$, $120^{\circ}06'01''\text{W}$), off Santa Rosa Island, 55 m; 11 ♀♀: 2 ♀♀ coll. Sieg, 2 ♀♀ in Senckenberg Museum, Frankfurt, Germany; 7 ♀♀ in National Museum of Natural History, Washington: USNM 170655. *Velero IV* sta. 24358/BLM 636 ($32^{\circ}40'0''\text{N}$, $119^{\circ}9'49''\text{W}$), Tanner Bank, southern California borderland, 120 m; 1 ♀ AHF, University of Southern California. Santa Cruz Island, Scorpio Harbour, California, 13 m; 1 ♀; Willis G. Hewatt coll. (USNM 86280). All specimens are syntypes.

Discussion.—This species closely resembles *Zeuxo normani* (Richardson), but can be distinguished by the relative proportions of the articles of antenna 1. The first article of *Anatanais* is twice the length of the second (rarely these proportions may vary from 3:1 to 2.5:1 in *Zeuxo*). There is also slight variation in some setae and plumose hairs, but they appear to be of no taxonomic value. The present distribution is only at the designated stations off Santa Cruz Island, Santa Rosa Island, and Tanner Bank within the southern California borderland.

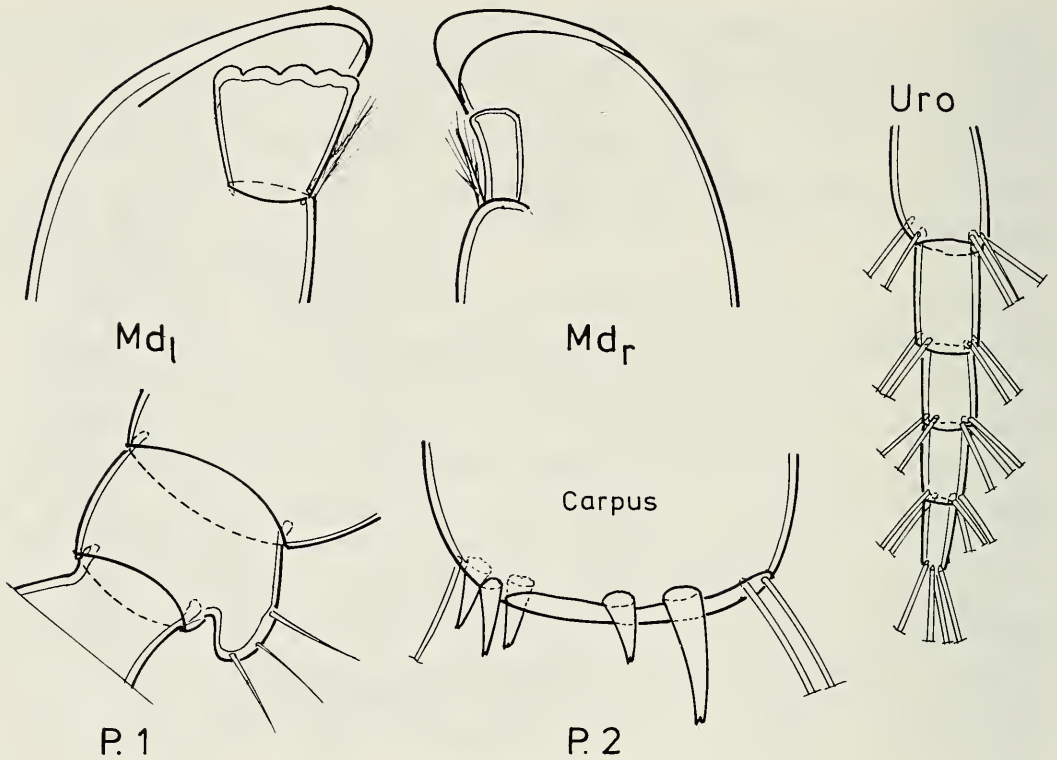


Fig. 14. *Zeuxo paranormani*.

Zeuxo normani (Richardson, 1901)

Fig. 13

Synonymy, see Sieg (1980).

Discussion.—In order to determine correctly the species of *Zeuxo* it is necessary to examine the coxa of pereopod 1 (Fig. 13), the carpus of pereopods 2–4, and the lacinia mobilis of the mandibles (Fig. 13). *Zeuxo normani* is characterized by the triangular protuberance extending from the coxa of pereopod 1, the 4 lateral and 2 medial spines borne distally on the carpus of pereopod 2 and the slightly reduced lacinia mobilis of the right mandible. In addition, the uropods (Fig. 13) of the adults consist of the basis and an endopod of 5 articles (“6-jointed”). A detailed redescription of the species is given, with figures, by Sieg (1980). The distribution of *Z. normani* is difficult to determine due to confusion with *Zeuxo paranormani*. At present it is reported from: Japan, without detailed locality (Shiino, 1951), and Tanabe Bay (Bieri and Tokioka, 1968); British Columbia, Nanoase Bay, False Narrows (Fee, 1927); Monterey Bay, California (type-locality, Richardson, 1905); Catalina Island, Anacapa Island, Santa Barbara Harbor, Moss Beach (Miller, 1968), and La Jolla (USNM 53846, det. Sieg).

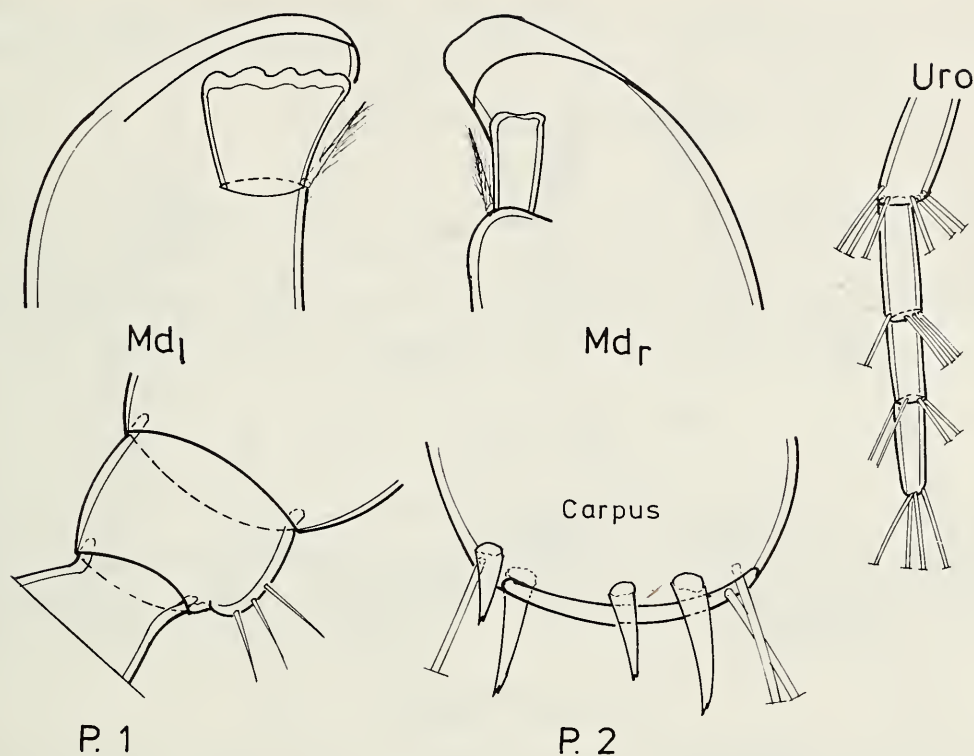


Fig. 15. *Zeuxo coralensis*.

Zeuxo paranormani Sieg, 1980

Fig. 14

A detailed description and discussion of this species, including figures, may be found in Sieg (1980).

Discussion.—*Zeuxo paranormani* has been confused with *Zeuxo normani*. The adults of *Z. paranormani* may be distinguished by the presence of uropods of 5 articles, while *Z. normani* have uropods of 6 articles (“6-jointed”). The protuberance of the coxa of pereopod 1 is somewhat less prominent in *Z. paranormani* than in *Z. normani*, and the carpus of pereopod 2 bears 2 medial and 4 lateral spines in *Z. normani*. The distribution of the species is presently known from scattered localities along the California coast: Humboldt Bay (USNM 66709), Santa Cruz Island (USNM 86281), La Jolla (USNM 53847), and Monterey Bay (USNM 30615), where it is noted as *Tanais normani* Richardson, 1905 type-material.

Zeuxo coralensis Sieg, 1980

Fig. 15

Discussion.—This species has been mentioned as occurring along the Pacific coasts of Japan and Panama Canal (Paitila, Sieg, 1980). It is included

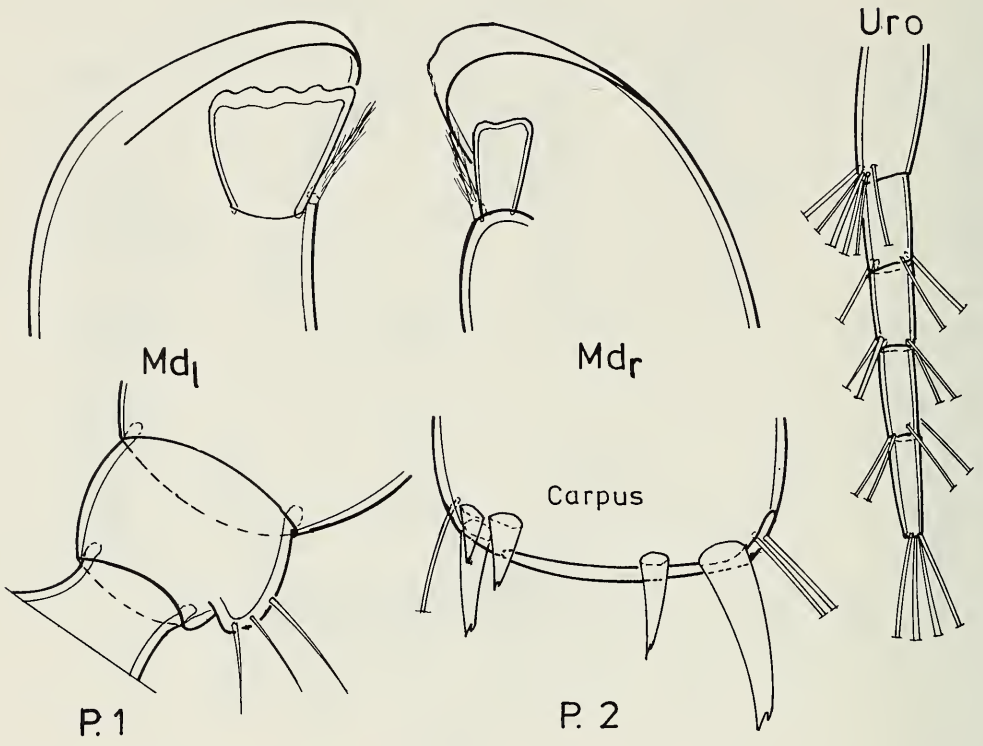


Fig. 16. *Zeuxo maledivensis*.

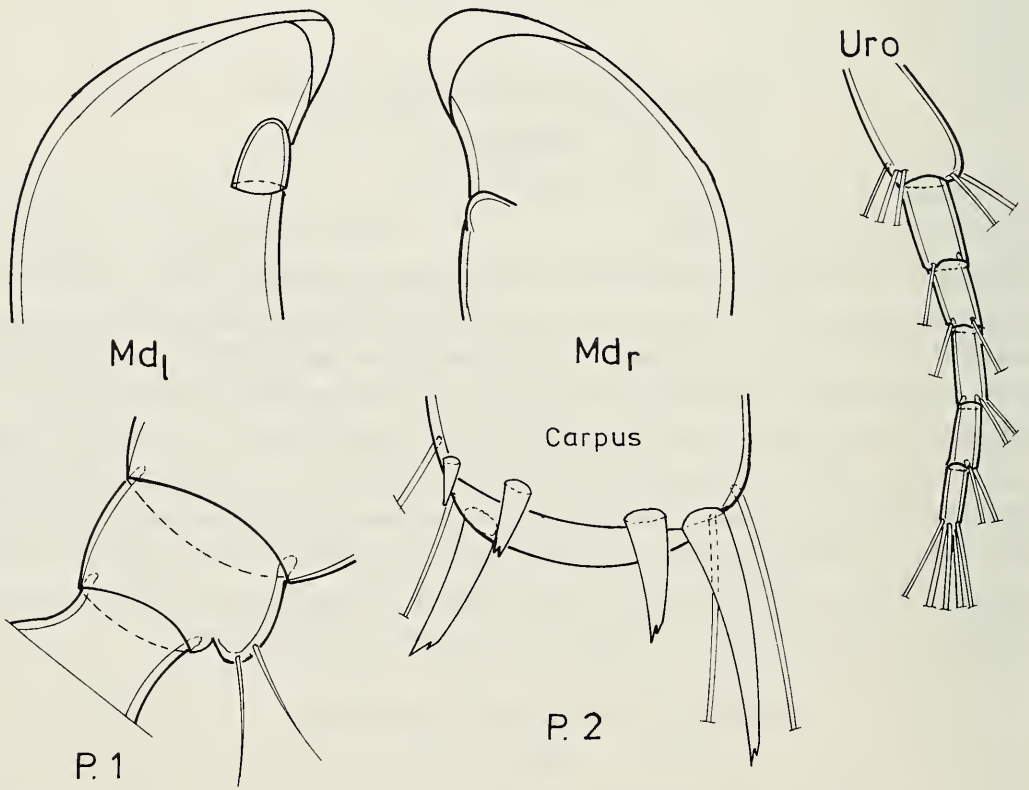


Fig. 17. *Zeuxo seurati*.

here because it possibly may occur along the California coast. For a discussion of the species see Sieg (1980).

Zeuxo maledivensis Sieg, 1980

Fig. 16

Discussion.—This species may also occur along the California coast, having been noted from the Maldives, Japan, and Florida. It may be distinguished from the other species in the Tanaidae by the figured details (Fig. 16). For a detailed description and discussion see Sieg (1980).

Zeuxo seurati Nobili, 1906

Fig. 17

Discussion.—*Zeuxo seurati* is recognized by the reduction of the left and right lacinia mobilis of the mandibles. It has been previously reported from the Tuamotu Islands, Japan (Nobili, 1906) and the Hawaiian Islands as *Anatanais insularis* (Miller, 1940).

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